

Group members: Marwane Bidamou (4), Eduard Koshkelyan (8), Roshan Maharjan (11)

Question 1

Write a Java program to solve the subset problem.

(a) T or F

Ans: See .java file

(b) One solution

Ans: See .java file

(c) All solutions

Ans: See .java file

Question 2

Solve subset problem where $S = \{3, 4, 7, 8\}$ and $k = 15$.

(a) T or F.

Ans:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	T			T												
4	T			T	T			T								
7	T			T	T			T			T	T			T	
8	T			T	T			T	T		T	T			T	T

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It is true because there is a subset $7 + 8 = 15$.

(b) One solution.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	{ }			{ 3 }												
4	{ }			{ 3 }	{ 4 }			{3, 4}								
7	{ }			{ 3 }	{ 4 }			{3, 4}			{3, 7}	{4, 7}			{3,4,7}	
8	{ }			{ 3 }	{ 4 }			{3, 4}	8		{3, 7}	{4, 7}			{3,4,7}	{7, 8}

Subset is (7, 8) and their sum is 15.

(c) All solutions.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	{ }			{ 3 }												
4	{ }			{ 3 }	{ 4 }			{3, 4}								
7	{ }			{ 3 }	{ 4 }			{3, 4}			{3, 7}	{4, 7}			{3,4,7}	
8	{ }			{ 3 }	{ 4 }			{3, 4}	8		{3, 7}	{4, 7}			{3,4,7}	{7, 8}

Only subset is (7, 8) and their sum is 15.

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Question 3

Solve the integer Knapsack problem given below:

The maximum allowable total weight in the knapsack is $W_{\max} = 20$

Item	a	b	c	d	e
value	25	12	24	16	28
Weight	5	6	8	2	7

Ans:

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	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	0	0	0	0	0	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
b	0	0	0	0	0	25	25	25	25	25	25	37	37	37	37	37	37	37	37	37	37
c	0	0	0	0	0	25	25	25	25	25	25	37	37	49	49	49	49	49	49	61	61
d	0	0	16	16	16	25	25	41	41	41	41	41	41	53	53	65	65	65	65	65	65
e	0	0	16	16	16	25	25	41	41	44	44	44	53	53	69	69	69	69	69	69	81

The maximum value for this knapsack problem is 81.

Question 4

Solve the fractional Knapsack problem given below:

The maximum allowable total weight in the knapsack is $W_{\max} = 20$

Item	a	b	c	d	e
value	25	12	24	16	28
Weight	5	6	8	2	7

Total weight = 20

Value per weight: a = 5, b = 2, c = 3, d = 8, e = 4

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Select: d, a, e, 0.75c
= 16 + 25 + 28 + 18
= 87

87 is the highest value we can fit with a maximum weight of 20 for this fractional knapsack problem.